REMARKS/ARGUMENTS

Reconsideration of the application is requested.

Claims 52, 54-56, 58-61, 63-71, and 78-107 remain in the application. Claims 52, 60, 78, and 105 have been amended. Claims 1-51, 53, 57, 62, and 72-77 have been cancelled. Claims 78-104 have been withdrawn.

In item 1 on page 2 of the above-identified Office action, claim 60 has been objected to because of an alleged informality.

More specifically, the Examiner has stated that the limitation "the intermediate carrier" in claim 60, line 9 has insufficient antecedent basis. Appropriate correction has been made.

In item 3 on pages 2-3 of the above-identified Office action, claim 61 has been rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

More specifically, the Examiner has stated that the specification does not describe what conditions and parameters are used to perform "maximum thermal cycling" as recited in claim 61 so that a dimensional comparison can be made for the "length of the contact element" and the respective "length difference/increase" with respect to centrally located neutral point of the substrate.

The configuration criteria for the length of the contact element are clear from the disclosure on page 8, line 13 to page 9, line 3.

It is firstly disclosed that the length of the contact element should be sufficient to compensate for expansion caused by thermal cycling. It is further clarified that this length should be at least 5% greater than the largest length difference between the substrate and an intermediate carrier relative to the centrally located neutral point of the substrate in the event of maximum thermal cycling.

The measurements, which a person skilled in the art should take, are, therefore, disclosed, i.e. the largest length difference between the substrate and the intermediate carrier in the event of thermal cycling. It is also disclosed which action the person skilled in the art should take, i.e. to

provide a contact element 5% longer than this length difference.

As already explained previously, the maximum thermal cycling is typically the acceptable working temperature range which is specified for the chip by the manufacturer and, therefore, known to the person skilled in the art. The other conditions mentioned by the Examiner can also be chosen by a person skilled in the art to be appropriate for the operating conditions of the package.

Since these parameters are design criteria and depend on the type of integrated circuits included in the chip and the conditions under which the chip will operate, it is not possible to specify them more exactly.

It is clearly disclosed which parameters are to be measured, i.e. the distance between the substrate and the intermediate carrier, the conditions, i.e. the desired maximum thermal cycling of the device, and which measures to be taken in view of this information, i.e. to provide a contact element 5% longer than this distance. A systematic optimization of specified parameters, using specified tests to achieve a specified result, does not require inventive skill.

Applicant, therefore, maintains that claim 61 is sufficiently supported by the description in the specification and the information is sufficient for a person skilled in the art to carry out the invention.

In item 5 on page 3 of the above-identified Office action, claim 61 has been rejected under 35 U.S.C. § 112, as being indefinite under 35 U.S.C. § 112, second paragraph.

More specifically, the Examiner has stated that it is not clear from the description in the specification what conditions and parameters (temperature, time, ramp rate, humidity, etc.) are selected to define the "maximum thermal cycling" so that a dimensional comparison can be made with respect to the length dimension of the contact element.

Please refer to the above detailed discussion with regard to the rejection under 35 U.S.C. § 112, first paragraph.

It is accordingly believed that the claims meet the requirements of 35 U.S.C. § 112, first and second paragraphs. Should the Examiner find any further objectionable items, counsel would appreciate a telephone call during which the matter may be resolved.

In item 7 on pages 4-17 of the above-mentioned Office action, claims 52, 54-56, 58-61, 63-71, and 105-107 have been rejected as being unpatentable over Yanof et al. (US Pat. No. 5,476,818) in view of Khandros et al. (US Pat. No. 5,917,707) under 35 U.S.C. § 103(a).

As will be explained below, it is believed that the claims were patentable over the cited art in their original form and the claims have, therefore, not been amended to overcome the references. However, the language of claims 50 and 105 has been slightly modified in an effort to even more clearly define the invention of the instant application.

More specifically, the phrase "integrally formed" has been changed to "integrally connected in one piece" in order to overcome the product-by-process objection and to clarify that the base and the straight part of the contact element are integral, i.e. made of one material. The support for the phrases "integrally connected" and "in one piece" may be found on page 3, lines 18-21 and page 5, lines 23-26, for example, of the specification as well as original claim 78.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claims 52 and 105 call for, inter alia:

> said contact area including a microscopically small contact element disposed thereon having a base and a substantially straight part integrally connected in one piece with and at an oblique angle with said base and extending from said contact area in three dimensions in a direction deviating from a direction orthogonal to said surface of said substrate and parallel to said electronic circuit on said substrate, said part extending from said contact area being preformed and angularly disposed obliquely relative to said surface of said substrate in an unstressed condition.

The invention of the instant application relates to improved contact elements for semiconductor chips and provides flexible contact elements, which have a high packing density, are mechanically reliable, and are fabricated in parallel. The chip with flexible contact elements is permanently mounted to an intermediate carrier, such as a rewiring board, to provide a semiconductor package.

The invention of the instant application provides, according to the independent claims, a chip or wafer including a plurality of contact elements in which the base and the straight part are integrally connected in one piece. The contact elements protrude from the chip or wafer at an oblique angle to the surface of the chip or wafer.

The cited prior art references provide a person skilled in the art no incentive to provide the component according to

independent claims of the instant application and neither reference provides any reason or motivation for a person to combine them.

Khandros et al. provide no incentive to a person skilled in the art to provide flexible contacts at an oblique angle to the surface of a semiconductor chip or wafer. Yanof et al., therefore, provide no incentive for the person skilled in the art to look to the teaching of Yanof et al.

Yanof et al. teach a device for the temporary mounting and testing of semiconductor chips. It is not obvious for a person skilled in the art to look to Yanof et al. when looking to provide a semiconductor chip or wafer with permanently attached flexible chip contacts.

Even if a person skilled in the art were to look to the unrelated teaching of Yanof et al., Yanof et al. fail to give any indication that a chip contact element formed at an oblique angle is desirable and fail to give any reason to provide a chip contact in which the straight part and the base are integrally connected in order to improve the mechanical reliability of permanently mounted chip contacts.

Therefore, in order to provide the chip contact element according to the invention of the instant application, a series of steps have to be taken, none of which is obvious from the prior art.

Firstly, the problem of the contact of Khandros et al., i.e. the poor packing density, has to be identified. This problem is not even hinted at in the disclosure of Khandros et al. The concept that a higher packing density can be achieved by providing contacts at an oblique angle is not indicated by Khandros et al. or Yanof et al. It is also not obvious from Yanof et al. that it is possible to provide contacts at an oblique angle at the microscopic scale required by chip contact elements.

In order to arrive at the contact element of the invention of the instant application, the invention of the instant application provides more reliable contact elements by discovering that the interface between the different metals of the straight part and the base of the contacts, as taught by Yanof et al., is likely to lead to delamination of the two parts at the interface. This problem is not mentioned by Yanof et al. and the contact element provided by the invention of the instant application, in which the base and the straight

part are integrally connected in one piece, is, therefore, not obvious from the teaching of Yanof et al.

None of these steps, which are required in order to provide the contact element of the invention of the instant application, are obvious from the prior art.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 52 and 105. Claims 52 and 105 are, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claim 52, they are believed to be patentable as well.

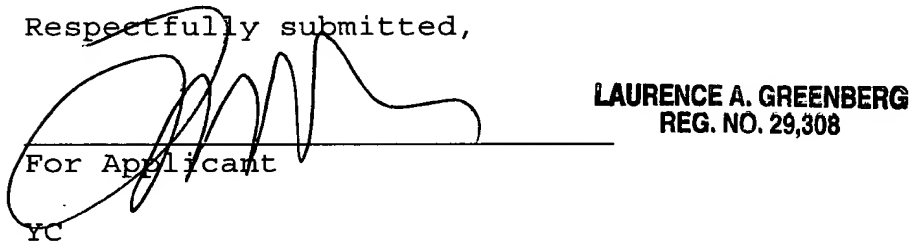
In view of the foregoing, reconsideration and allowance of claims 52, 54-56, 58-61, 63-71, and 105-107 are solicited. Rejoinder of method claims 78-104 is requested upon allowance of the product claims. MPEP 821.04.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out. In the alternative, the entry of the amendment is requested as it is believed to place the application in better condition

for appeal, without requiring extension of the field of search.

If an extension of time for this paper is required, petition for extension is herewith made. Please charge any fees which might be due with respect to 37 CFR Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,



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